

Claims;

1. An image forming apparatus, comprising:
 - a rotationally driven photoreceptor;
 - a charging device to electrically charging the photoreceptor;
 - an exposing device to imagewise exposing the photoreceptor so that a latent image is formed on the photoreceptor;
 - a developing device to develop the latent image with toner so that a toner image is formed on the photoreceptor;
 - a transfer device to transfer the developed image to a recording material; and
 - a cleaning unit which removes residual toner on said photoreceptor which has passed a transfer zone in which a toner image formed on said photoreceptor is transferred to a recording material in which said cleaning unit comprises a cleaning roller which is disposed so as to come into contact with the surface of said photoreceptor, a bias voltage applying means which applies a bias voltage to said cleaning roller, and a flat board-shaped cleaning blade comprised of an elastic body which is disposed so that the leading edge of said cleaning blade comes into

contact with the surface of said latent image holding member downstream from said cleaning roller with respect to the movement direction of said photoreceptor, and said cleaning blade is supported rotatably around predetermined rotationally driven center axis O parallel to the rotational axis of said photoreceptor so that said cleaning blade is rotationally driven from the standard state in which the leading edge comes into contact with the surface of said photoreceptor while its total shape is not deformed and subsequently, is subjected to a working state while its entire body is curved, and the position of said rotationally driven center axis O is set so that said cleaning blade, in its standard state, satisfies the Conditions (1) and (2):

Condition (1): in the cross-section perpendicular to the rotational axis of said photoreceptor, straight line T drawn between contact position P of the leading edge of said cleaning blade with said photoreceptor and said rotationally driven center axis O is positioned between tangential line N at said contact position P and said cleaning blade, and

Condition (2): in the cross-section perpendicular to the rotational axis of said photoreceptor, contact angle θ of said cleaning blade with respect to the tangential line of

said photoreceptor at said contact point P is from 0 to 30 degrees.

2. The image forming apparatus of claim 1 wherein the contact load on said cleaning blade is from 5 to 50 g/cm.

3. The image forming apparatus of claim 1 wherein the bias voltage applying means is a constant current power source.

4. An image forming apparatus, comprising:

a rotationally driven photoreceptor;

a charging device to electrically charging the photoreceptor;

an exposing device to imagewise exposing the photoreceptor so that a latent image is formed on the photoreceptor;

a developing device to develop the latent image with toner so that a toner image is formed on the photoreceptor employing toner comprising a lubricant as the external agent;

a transfer device to transfer the developed image to a recording material in the transfer zone; and

a cleaning unit which removes residual toner on said photoreceptor which has passed said transfer zone, wherein

said cleaning unit comprises a cleaning roller which is disposed so as to come into contact with the surface of said photoreceptor, a bias voltage applying means which applies a bias voltage to said cleaning roller, and a flat board-shaped cleaning blade comprised of an elastic body which is disposed so that the leading edge of said cleaning blade comes into contact with the surface of said latent image holding member downstream from said cleaning roller with respect to the movement direction of said photoreceptor, and which comprises a control mechanism comprising a specified toner image forming function which forms a toner image for maintaining a blade effect to maintain the desired cleaning effect of said cleaning blade which reaches a cleaning zone employing said blade after passing said transfer zone.

5. The image forming apparatus of claim 1 wherein the control mechanism is capable of allowing said toner image for maintaining a blade effect to reach said cleaning zone, in which said cleaning blade is employed, by decreasing the cleaning effect obtained by said cleaning roller. In this case, when said toner image for maintaining the blade effect passes the cleaning zone in which said cleaning roller is employed, it is preferable that the cleaning effect obtained

employing said cleaning roller is decreased by decreasing or eliminating the bias voltage which is applied to said cleaning roller.

6. The image forming apparatus of claim 1 wherein the specified toner image forming function of said control mechanism controls the operation of said image forming unit so that said toner image for maintaining the blade effect is formed at every specified image forming frequency. Further, said bias voltage applying means is comprised of a constant current power source.

7. The image forming apparatus of claim 4 wherein a toner employed to form the toner image comprises toner particles having a volume average particle diameter of 8.5 μm or less, which are prepared employing a polymerization method.

8. The image forming apparatus of claim 4 wherein the toner employed to form a toner image may be comprised of toner particles, having a volume average particle diameter of 8.5 μm or less, which are prepared employing a polymerization method.

9. An image forming apparatus, comprising:

a rotationally driven photoreceptor;

a charging device to electrically charging the photoreceptor which is arranged so as to face said photoreceptor while maintaining parallel to the axis;

an exposing device to imagewise exposing the photoreceptor so that a latent image is formed on the photoreceptor;

a developing device to develop the latent image with toner so that a toner image is formed on the photoreceptor employing toner comprising a lubricant as the external agent;

a transfer device which is arranged to face the photoreceptor while maintaining parallel to the axis and transfers a toner image on the photoreceptor onto a recording material in the transfer zone; and

a cleaning unit which removes the toner on said photoreceptor which passes through said transfer zone, in which said cleaning unit comprises a cleaning blade which comes into contact with the surface of said photoreceptor, a cleaning roller which comes into contact with the surface of said latent image holding member upstream with respect to the movement direction of said photoreceptor and is arranged to

maintain parallel to the axis of said photoreceptor, and a bias voltage applying means which applies a bias voltage to said cleaning roller,
is characterized in that formulas (1) and (2) described below are satisfied;

$$\text{Formula (1)} \quad W2 < W1$$

$$\text{Formula (2)} \quad |W3 - W1| \leq 30 \text{ (in mm)}$$

wherein W1 is the effective cleaning area obtained by said cleaning roller in the axis direction of said photoreceptor, W2 is the effective transferring area of said transfer unit, and W3 is the effective charging area of said charging unit.

10. The image forming apparatus of claim 9 wherein the cleaning unit comprises a bias voltage applying means which is a constant current power source.

11. The image forming apparatus of claim 9 wherein the cleaning unit comprises a cleaning roller which is insulated in lateral direction in the part which is located beyond the part corresponding to the area effectively charged by said charging unit.

12. The image forming apparatus of claim 9 wherein the bias voltage applying means in said cleaning unit is a constant current power source.

13. The image forming apparatus of claim 9 wherein the cleaning unit comprises a cleaning roller which is conductive in its lateral direction in the part corresponding to the area in which the surface of said photoreceptor is effectively charged by said charging unit and is simultaneously insulated in the part beyond both edges of the part corresponding to said effectively charged area.

14. The image forming apparatus of claim 9 wherein surface roughness Rz of the photoreceptor is from 0.1 to 2.5 μm .

15. The image forming apparatus of claim 9 wherein constant current power source outputs a constant current of 1 to 50 μA .